

## NPN Silicon RF Transistor

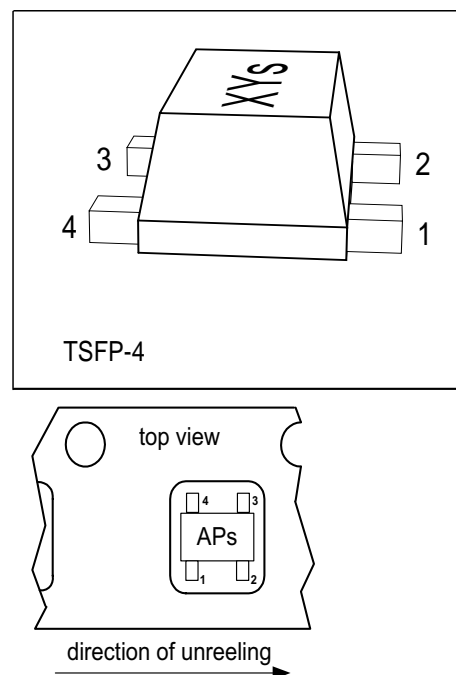
### Preliminary data

- For highest gain low noise amplifier  
at 1.8 GHz and 2 mA / 2 V

**Outstanding  $G_{ms} = 23$  dB**

**Noise Figure  $F = 0.95$  dB**

- For oscillators up to 15 GHz
- Transition frequency  $f_T = 45$  GHz
- Gold metallization for high reliability
- **SIEGET® 45 - Line**  
**45 GHz  $f_T$  - Line**



**ESD:** Electrostatic discharge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration				Package
BFP520F	APs	1 = B	2 = E	3 = C	4 = E	TSFP-4

### Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	2.5	V
Collector-base voltage	$V_{CBO}$	10	
Emitter-base voltage	$V_{EBO}$	1	
Collector current	$I_C$	40	mA
Base current	$I_B$	4	
Total power dissipation $T_S \leq 107^\circ\text{C}$	$P_{tot}$	100	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Ambient temperature	$T_A$	-65 ... 150	
Storage temperature	$T_{stg}$	-65 ... 150	

### Thermal Resistance

Junction - soldering point <sup>1)</sup>	$R_{thJS}$	$\leq 430$	K/W
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<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC characteristics					
Collector-emitter breakdown voltage $I_C = 1\text{ mA}, I_B = 0$	$V_{(BR)CEO}$	2.5	3	3.5	V
Collector-base cutoff current $V_{CB} = 5\text{ V}, I_E = 0$	$I_{CBO}$	-	-	200	nA
Emitter-base cutoff current $V_{EB} = 1\text{ V}, I_C = 0$	$I_{EBO}$	-	-	35	μA
DC current gain $I_C = 20\text{ mA}, V_{CE} = 2\text{ V}$	$h_{FE}$	70	110	200	-
AC characteristics (verified by random sampling)					
Transition frequency $I_C = 30\text{ mA}, V_{CE} = 2\text{ V}, f = 2\text{ GHz}$	$f_T$	-	45	-	GHz
Collector-base capacitance $V_{CB} = 2\text{ V}, f = 1\text{ MHz}$	$C_{cb}$	-	0.07	-	pF
Collector-emitter capacitance $V_{CE} = 2\text{ V}, f = 1\text{ MHz}$	$C_{ce}$	-	0.25	-	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}$	$C_{eb}$	-	0.31	-	
Noise figure $I_C = 2\text{ mA}, V_{CE} = 2\text{ V}, Z_S = Z_{Sopt}, f = 1.8\text{ GHz}$	$F$	-	0.95	-	dB
Power gain, maximum stable <sup>1)</sup> $I_C = 20\text{ mA}, V_{CE} = 2\text{ V}, Z_S = Z_{Sopt}, Z_L = Z_{Lopt}, f = 1.8\text{ GHz}$	$G_{ms}$	-	23	-	
Insertion power gain $I_C = 20\text{ mA}, V_{CE} = 2\text{ V}, f = 1.8\text{ GHz}, Z_S = Z_L = 50\Omega$	$ S_{21} ^2$	-	20.5	-	dB
Third order intercept point at output <sup>2)</sup> $V_{CE} = 2\text{ V}, f = 1.8\text{ GHz}, Z_S=Z_L=50\Omega, I_C = 20\text{ mA}$	$IP_3$	-	23.5	-	dBm
1dB compression point <sup>3)</sup> $V_{CE} = 2\text{ V}, f = 1.8\text{ GHz}, Z_S=Z_L=50\Omega, I_C = 20\text{ mA}$	$P_{-1dB}$	-	10.5	-	

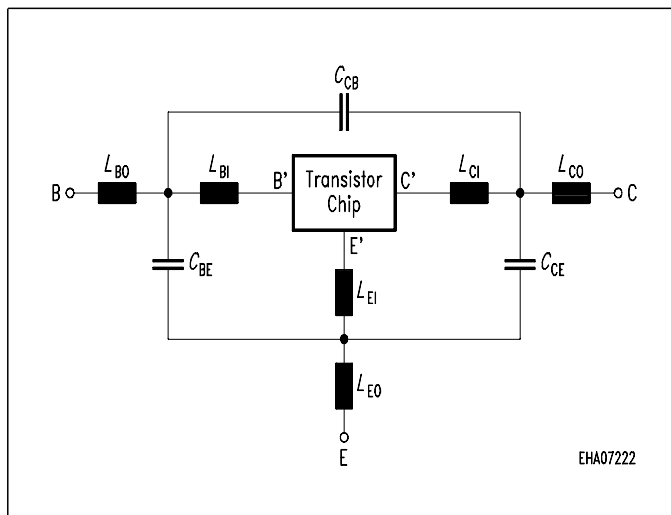
$$^1G_{ms} = |S_{21} / S_{12}|$$

<sup>2</sup> $IP_3$  value depends on termination of all intermodulation frequency components. Termination used for this measurement is  $50\Omega$  from 0.1MHz to 6GHz.

<sup>3</sup>DC current at no input power

**SPICE Parameters (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax) :**
**Transistor Chip Data**

IS =	15	aA	BF =	235	-	NF =	1	-
VAF =	25	V	IKF =	0.4	A	ISE =	25	fA
NE =	2	-	BR =	1.5	-	NR =	1	-
VAR =	2	V	IKR =	0.01	A	ISC =	20	fA
NC =	2	-	RB =	11	$\Omega$	IRB =	-	A
RBM =	7.5	$\Omega$	RE =	0.6		RC =	7.6	$\Omega$
CJE =	235	fF	VJE =	0.958	V	MJE =	0.335	-
TF =	1.7	ps	XTF =	10	-	VTF =	5	V
ITF =	0.7	mA	PTF =	50	deg	CJC =	93	fF
VJC =	0.661	V	MJC =	0.236	-	XCJC =	1	-
TR =	50	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0.333	-	XTB =	-0.25	-	EG =	1.11	eV
XTI =	0.035	-	FC =	0.5	-	TNOM	298	K

**Package Equivalent Circuit:**


$L_{BO} =$	0.22	nH	$L_{BI} =$	0.42	nH
$L_{EO} =$	0.28	nH	$R_{LBI} =$	0.15	$\Omega$
$L_{CO} =$	0.22	nH	$L_{EI} =$	0.26	nH
$K_{BO-EO} =$	0.10	-	$R_{LEI} =$	0.11	$\Omega$
$K_{BO-CO} =$	0.01	-	$L_{CI} =$	0.35	nH
$K_{EO-CO} =$	0.11	-	$R_{LCI} =$	0.13	$\Omega$
$C_{BE} =$	34	fF	$K_{CI-EI} =$	-0.05	-
$C_{BC} =$	2	fF	$K_{BI-CI} =$	-0.08	-
$C_{CE} =$	33	fF	$K_{BI-EI} =$	0.20	-

Valid up to 6GHz

The TSFP-4 package has two emitter leads. To avoid high complexity of the package equivalent circuit, both leads are combined in one electrical connection.

$R_{LXI}$  are series resistors for the inductances  $L_{XI}$  and  $K_{xa-yb}$  are the coupling coefficients between the inductances  $L_{xa}$  and  $L_{yb}$ . The referencepins for the coupled ports are B, E, C, B', E', C'.

For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet:  
<http://www.infineon.com/silicondiscretes>